

**From:** [Jay Field](#)  
**To:** [Eric Blischke/R10/USEPA/US@EPA](#)  
**Cc:** [Burt Shephard/R10/USEPA/US@EPA](#); [Robert Neely](#); [Jennifer Peterson](#); [Joe Goulet/R10/USEPA/US@EPA](#); [Mary Baker](#)  
**Subject:** Re: Bioassay Evaluation  
**Date:** 07/15/2008 10:23 AM

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Eric,  
I completely agree with Jennifer that using model thresholds that deviate significantly from the empirical thresholds for the purposes of defining risk to the benthic community is difficult to understand or justify.

some additional information, based on the existing models:

using the proposed thresholds for Hyalella and Chironomus, there are 52 (of original 233) samples that would be classified as hits (32 for Hyalella and 39 for Chironomus).  
41 of 52 have an LRM PR\_Max>0.6  
32 of 52 exceed the FPM based on 80% threshold (Q80>1)

51 samples have a PR\_max>0.6 and do not exceed the proposed toxicity thresholds  
25 samples have a PR\_max>0.7 and do not exceed the proposed toxicity thresholds

43 samples exceed the FPM (80%) and do not exceed the proposed toxicity thresholds

21 samples have a PR\_max>0.6 and all survival/growth endpoints have greater than or equal to 80% of control  
23 samples have a Q80>1 and all survival/growth endpoints have greater than or equal to 80% of control

I conclude from this that both models identify most of these highly toxic samples. With more reasonable thresholds (80% of control for all endpoints), the number of "false positives" is low for both models. In my view, the best approach is to develop the models using a reasonable conservative thresholds (which has already been done) and adjust probability thresholds for risk management.

Jay Field wrote:

> Eric,  
> I assume from item #6 that you are proposing to derive new LRMs based  
> on the thresholds you identified. The proposed thresholds, which I  
> consider to be extreme, will make the development of reliable logistic  
> regression models highly unlikely because of the small number of "hit"  
> samples. The basis for the new growth thresholds is not clear, given  
> that all of the growth results with less than 80% of control were  
> statistically different from the control. If your intent is to  
> incorporate risk management decisions into the models, I would  
> recommend applying those concepts to model application, not model  
> development. Please let me know if I can provide further assistance.  
> Jay

>  
> [6] The evaluation of the bioassay data for the development of the  
> predictive models will be based on the following hit thresholds:  
> - Chironomus Growth - 30%  
> - Chironomus Mortality - 20%  
> - Hyalella Growth - 40%  
> - Hyalella Mortality - 20%

> Blischke.Eric@epamail.epa.gov wrote:

>> All,  
>>  
>> We have been discussing the evaluation of the bioassay at length over  
>> the last month or so and off and on for the last four years. In  
>> general, I believe that the empirical toxicity test results is our  
>> strongest line of evidence for evaluating effects on the benthic  
>> community. However, I recognize the need to develop site specific  
>> predictive models to assist the evaluations of stations where sediment  
>> toxicity test results are not available. At the heart of this  
>> discussion has been the use of the Hyalella growth endpoint in the  
>> predictive models.

>>  
>> An evaluation of the empirical Hyalella growth data suggests that  
>> Hyalella growth at the 10% and 20% difference from control hit  
>> thresholds can be used to delineate the extent of contamination at the  
>> Portland Harbor Site. However, LWG representatives have maintained  
>> that, on a chemical by chemical basis, it is not possible to see a  
>> difference between the hit and no-hit distributions at these levels. As  
>> a result, the Round 2 Report did not consider the Hyalella growth  
>> endpoint during the development of the floating point percentile model  
>> (FPM). EPA has maintained that the Hyalella growth endpoint adds  
>> valuable information and thus should be included in the model.

>>  
>> Regarding the evaluation of empirical data, the LWG has agreed to our  
>> recommended approach which was to evaluate all four endpoints (Hyalella  
>> growth and mortality; Chironomus growth and mortality) at the 10, 20 and  
>> 30% difference from control level. The LWG sought to address our  
>> concern about the use of the Hyalella growth endpoint by proposing the  
>> RSET one-hit/two-hit threshold for use in the predictive models. This  
>> proposal was not endorsed by the project team.  
>>

>> On Friday afternoon, Burt and I spoke with John Toll and Helle Anderson  
>> about the evaluation of benthic risk. At the end of the discussion, we  
>> came up with the following approach.  
>>  
>> 1) Evaluate the empirical toxicity data as we have described - a hit is  
>> a statistically significant difference from control for any of the four  
>> endpoints.  
>> 2) Substitute total biomass for the growth endpoint for both the  
>> Hyalella and the chironomus tests.  
>> 3) Empirical data will be further refined by classifying the toxicity  
>> tests into minor (10%) moderate (20%) and severe effects (30%).  
>> 4) For the LRM and FPM, we will pool the growth (biomass) and mortality  
>> endpoints for chironomus and again for Hyalella.  
>> 5) Pooling will be based on use of the most sensitive endpoint (growth  
>> or mortality) resulting two LRM and two FPM models.  
>> 6) The evaluation of the bioassay data for the development of the  
>> predictive models will be based on the following hit thresholds:  
>> - Chironomus Growth - 30%  
>> - Chironomus Mortality - 20%  
>> - Hyalella Growth - 40%  
>> - Hyalella Mortality - 20%  
>> 7) These thresholds will apply to both the logistic and floating  
>> percentile models.  
>> 8) The results from these models will be equivalent to site specific  
>> probable effect levels.  
>> 9) The draft RI report will present an evaluation of the hit  
>> thresholds used in the predictive models. The evaluation will compare  
>> the separation of sediment chemistry distributions at the hit and no hit  
>> stations as a way to assess the utility of using lower hit thresholds in  
>> the predictive models, evaluate the reliability of the predictive models  
>> and make recommendations regarding the optimization of model  
>> performance.  
>> 10) The model results will be used in the conjunction of other lines of  
>> evidence in the baseline risk assessment and in the development of PRGs.  
>>  
>> Although the hit thresholds identified for the predictive models are  
>> higher than what we have discussed previously, we will perform analysis  
>> on the back end to assess the utility of using lower thresholds. This  
>> analysis will be presented in the draft baseline ecological risk  
>> assessment and the hit/no-hit thresholds will be adjusted as necessary  
>> prior to the final BERA. In my view, the hit threshold or thresholds  
>> selected for use in the predictive models are for the purpose of  
>> optimizing model performance. Due to the large number of sources and  
>> source types at the Portland Harbor site, the predictive model results  
>> do not necessarily match up well with the empirical bioassay results.  
>> In a perfect world, we would perform the necessary analysis to determine  
>> the optimum hit threshold or thresholds prior to running the model.  
>> However, the project schedule does not allow this approach. In any  
>> event, the predictive model results are only one line of evidence for  
>> evaluating risk to the benthic community and will be weighted  
>> accordingly in the baseline ecological risk assessment (BERA). These  
>> results will be used along with other lines of evidence (e.g., SQGs,  
>> application of benthic tissue TRVs and BSAFs) to identify areas that  
>> pose risk to the benthic community and develop sediment cleanup levels  
>> protective of the benthic community.  
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>> Please let me know if you have any questions. I will cover this at this  
>> week's TCT.  
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>> Thanks, Eric  
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